

(12) INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(19) World Intellectual Property
Organization
International Bureau



(43) International Publication Date
12 February 2004 (12.02.2004)

PCT

(10) International Publication Number
WO 2004/013778 A3

(51) International Patent Classification⁷: **G06F 17/50**

(21) International Application Number:
PCT/JP2003/009821

(22) International Filing Date: 1 August 2003 (01.08.2003)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:
2002-225860 2 August 2002 (02.08.2002) JP

(71) Applicant (for all designated States except US): **YAZAKI CORPORATION** [JP/JP]; 4-28, Mita 1-chome, Minato-ku, Tokyo 108-8333 (JP).

(72) Inventors; and

(75) Inventors/Applicants (for US only): **SUGIHARA, Kokichi** [JP/JP]; c/o THE UNIVERSITY OF TOKYO,

3-1, Hongo 7-chome, Bunkyo-ku, Tokyo 113-0033 (JP).
SAWAI, Masayoshi [JP/JP]; c/o Yazaki Parts Co., Ltd., 2464-48, Washizu, Kosai-shi, Shizuoka 431-0431 (JP).

(74) Agents: **OGURI, Shohei** et al.; Eikoh Patent Office, 28th Floor, ARK Mori Building, 12-32, Akasaka 1-chome, Minato-ku, Tokyo 107-6028 (JP).

(81) Designated States (national): AU, CN, KR, US.

(84) Designated States (regional): European patent (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PT, RO, SE, SI, SK, TR).

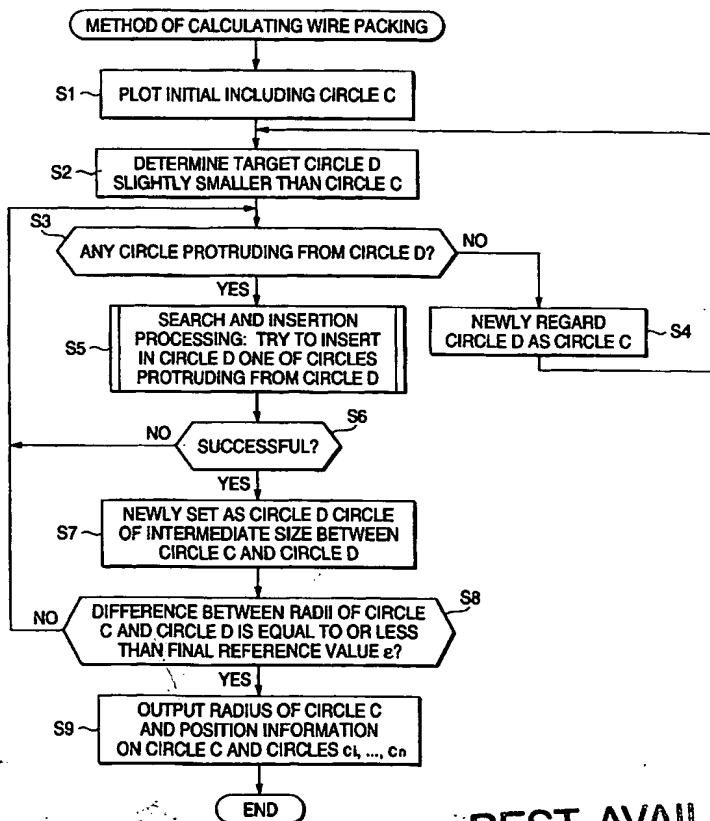
Published:

- with international search report
- before the expiration of the time limit for amending the claims and to be republished in the event of receipt of amendments

(88) Date of publication of the international search report:
10 September 2004

[Continued on next page]

(54) Title: METHOD OF CALCULATING A WIRE PACKING DIAMETER, APPARATUS THEREFOR, AND PROGRAM THEREFOR



(57) Abstract: To provide an effective calculation method and an apparatus therefor for obtaining an outside diameter of a wire packing by bundling and packing a plurality of wires into the smallest possible circular shape. The outside diameter of a wire harness surrounding a plurality of wires is efficiently obtained by repeatedly calculating an operation in which the layout of the plurality of wires making up the wire harness is changed such that, by using a computer, the wires are moved as distantly as possible from the wire protruding from an including circle, and the protruding wire is inserted in a space thus created. In particular, by adopting the concept of a circular Voronoi diagram, it becomes possible to obtain the outside diameter of the wire harness extremely simply and in a short time.

WO 2004/013778 A3

BEST AVAILABLE COPY

WO 2004/013778 A3



For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.

BEST AVAILABLE COPY

A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 G06F17/50

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC 7 G06F G01B H01B

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, INSPEC

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	<p>SUGIHARA K: "Estimation of the Sizes of Wire Bundles in Manufacturing" MATHEMATICAL METHODS IN MANUFACTURING AND LOGISTICS, 'Online! vol. 54, no. 2001, 16 December 2001 (2001-12-16), page 14, XP002285233 MATHEMATISCHES FORSCHUNGSINSTITUT OBERWOLFACH Retrieved from the Internet: URL:www.mfo.de/programme/schedule/2001/51/Report_54_01.ps> 'retrieved on 2004-06-18! page 14</p> <p style="text-align: center;">----- -/-</p>	1,3-5,7,8

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

* Special categories of cited documents:

- *A* document defining the general state of the art which is not considered to be of particular relevance
- *E* earlier document but published on or after the international filing date
- *L* document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- *O* document referring to an oral disclosure, use, exhibition or other means
- *P* document published prior to the international filing date but later than the priority date claimed

- *T* later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
- *X* document of particular relevance; the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone
- *Y* document of particular relevance; the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art.
- * & * document member of the same patent family

Date of the actual completion of the international search

6 July 2004

Date of mailing of the international search report

27/07/2004

Name and mailing address of the ISA

European Patent Office, P.B. 5818 Patentlaan 2
NL - 2280 HV Rijswijk
Tel (+31-70) 340-2040, Tx. 31 651 epo nl,
Fax (+31-70) 340-3016

Authorized officer

Alonso Nogueiro, L

C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	<p>HUANG ET AL: "Local Search Based on a Physical Model for Solving a Circle Packing Problem"</p> <p>MIC'2001 4TH METAHEURISTICS CONFERENCE, 16 July 2001 (2001-07-16), pages 455-459, XP002285969</p> <p>PORTO, PORTUGAL</p> <p>page 455</p> <p>page 457 - page 458</p>	1-8
A	<p>-----</p> <p>DATABASE INSPEC 'Online!</p> <p>THE INSTITUTION OF ELECTRICAL ENGINEERS, STEVENAGE, GB; 1998,</p> <p>ARAI M ET AL: "Packing circles under variable spatial constraints: a vibration control approach"</p> <p>XP002287151</p> <p>Database accession no. 6710347</p> <p>abstract</p> <p>& INTELLIGENT AUTONOMOUS SYSTEMS. IAS-5, INTELLIGENT AUTONOMOUS SYSTEMS. IAS-5, SAPPORO, JAPAN, 1998, 1998, pages 727-734, 1998, Amsterdam, Netherlands, IOS Press, Netherlands</p> <p>ISBN: 90-5199-398-6</p>	1-8
A	<p>-----</p> <p>EP 0 718 597 A (SUMITOMO WIRING SYSTEMS)</p> <p>26 June 1996 (1996-06-26)</p> <p>abstract</p> <p>page 5 - page 6</p> <p>page 8</p> <p>claim 1</p>	1-8
A	<p>-----</p> <p>DEOK-SOO KIM ET AL: "Robust and fast algorithm for a circle set Voronoi diagram in a plane"</p> <p>2001, BERLIN, GERMANY, SPRINGER-VERLAG, GERMANY, May 2001 (2001-05), pages 718-727, XP002285235</p> <p>ISBN: 3-540-42232-3</p> <p>the whole document</p> <p>-----</p>	2,6

INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/03/09821

Patent document cited in search report		Publication date		Patent family member(s)		Publication date
EP 0718597	A	26-06-1996	JP	2979988 B2		22-11-1999
			JP	8180747 A		12-07-1996
			DE	69523879 D1		20-12-2001
			DE	69523879 T2		11-04-2002
			EP	0718597 A2		26-06-1996
			US	5680330 A		21-10-1997
<hr/>						